

CLAIMS

1. A snowmobile, comprising:
 - a frame;
 - an engine disposed on the frame;
 - a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
 - at least one ski disposed on the frame;
 - a seat disposed on the frame, suitable for a rider with a center of gravity; and
 - a steering device disposed on the frame forward of the seat, the steering device being operatively connected to the at least one ski for steering the snowmobile,wherein the snowmobile has a first center of gravity without the rider and a second center of gravity with the rider, and
 - wherein a distance between a vertical line passing through the first center of gravity and a vertical line passing through the second center of gravity is between about 0 cm and 14 cm.
2. The snowmobile of claim 1, wherein the distance is between about 2 and 12 cm.
3. The snowmobile of claim 2, wherein the distance is between about 4 and 10 cm.
4. The snowmobile of claim 3, wherein the distance is between about 5 and 7 cm.
5. The snowmobile of claim 4, wherein the distance is about 5 cm.
6. A snowmobile, comprising:
 - a frame;
 - an engine disposed on the frame;
 - a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
 - at least one ski disposed on the frame;
 - a seat disposed on the frame, suitable for a rider with a center of gravity; and
 - a steering device disposed on the frame forward of the seat, the steering device being operatively connected to the at least one ski for steering the snowmobile,wherein the snowmobile has a first center of gravity without the rider and a second center of gravity with the rider, and
 - wherein a line passing through the first center of gravity of the snowmobile and the second center of gravity forms an angle with horizontal that is between about 35 and 90°.

7. The snowmobile of claim 6, wherein the angle is between about 50 and 90°.
8. The snowmobile of claim 7, wherein the angle is between about 62 and 90°.
9. The snowmobile of claim 8, wherein the angle is about 67°.
10. A snowmobile, comprising:
 - a frame;
 - an engine disposed on the frame;
 - a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
 - a forward-most drive track axle disposed on the frame;
 - at least one ski disposed on the frame;
 - a seat disposed on the frame, suitable for a rider with a center of gravity;
 - a steering device disposed on the frame forward of the seat, the steering device being operatively connected to the at least one ski for steering the snowmobile; and
 - wherein a distance between a vertical line passing through the forward-most drive track axle and a vertical line passing through the center of gravity of the rider is between about 15 and 65 cm.
11. The snowmobile of claim 10, wherein the distance is between about 25 and 55 cm.
12. The snowmobile of claim 11, wherein the distance is between about 35 and 55 cm.
13. The snowmobile of claim 12, wherein the distance is between about 37 and 47 cm.
14. The snowmobile of claim 13, wherein the distance is about 40 cm.
15. The snowmobile of claim 14, wherein the distance is about 45 cm.
16. A snowmobile, comprising:
 - a frame;
 - an engine disposed on the frame;
 - a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
 - a forward-most drive track axle disposed on the frame;

at least one ski disposed on the frame;
a seat disposed on the frame, suitable for a rider having a center of gravity;
a steering device disposed on the frame forward of the seat, the steering device being
operatively connected to the at least one ski for steering the snowmobile; and
wherein a line passing through the forward-most drive track axle and the center of
gravity of the rider forms an angle with horizontal that is between about 41 and 75°.

17. The snowmobile of claim 16, wherein the angle is between about 45 and 65°.
18. The snowmobile of claim 17, wherein the angle is between about 50 and 60°.
19. The snowmobile of claim 18, wherein the angle is about 55°.
20. A snowmobile, comprising:
 - a frame;
 - an engine disposed on the frame;
 - a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
 - at least one ski disposed on the frame;
 - a seat disposed on the frame, suitable for a rider with a center of gravity; and
 - a steering device disposed on the frame forward of the seat, the steering device being operatively connected to the at least one ski for steering the snowmobile,
 - wherein the snowmobile has a center of gravity without the rider, and
 - wherein a distance between a vertical line passing through the center of gravity of the snowmobile without the rider and a vertical line passing through the center of gravity of the rider is between about 5 and 55 cm.
21. The snowmobile of claim 20, wherein the distance is between about 15 and 45 cm.
22. The snowmobile of claim 21, wherein the distance is between about 25 and 45 cm.
23. The snowmobile of claim 22, wherein the distance is between about 27 and 37 cm.
24. The snowmobile of claim 23, wherein the distance is about 30 cm.
25. The snowmobile of claim 24, wherein the distance is about 35 cm.

26. A snowmobile, comprising:
a frame;
an engine disposed on the frame;
a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
at least one ski disposed on the frame;
a seat disposed on the frame, suitable for a rider having a center of gravity; and
a steering device disposed on the frame forward of the seat, the steering device being operatively connected to the at least one ski for steering the snowmobile,
wherein the snowmobile has a center of gravity without the rider, and
wherein a line passing through the center of gravity of the snowmobile without the rider and the center of gravity of the rider forms an angle with horizontal that is between about 39 and 79°.
27. The snowmobile of claim 26, wherein the angle is between about 49 and 69°.
28. The snowmobile of claim 27, wherein the angle is between about 54 and 64°.
29. The snowmobile of claim 28, wherein the angle is about 59°.
30. A snowmobile, comprising:
a frame;
an engine disposed on the frame;
a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
at least one ski disposed on the frame;
a seat disposed on the frame, suitable for a rider with a center of gravity; and
a steering device disposed on the frame forward of the seat, the steering device being operatively connected to the at least one ski for steering the snowmobile,
wherein the snowmobile has a center of gravity with the rider, and
wherein a distance between a vertical line passing through the center of gravity of the snowmobile with the rider and a vertical line passing through the center of gravity of the rider is between about 0 and 50 cm.
31. The snowmobile of claim 30, wherein the distance is between about 10 and 40 cm.
32. The snowmobile of claim 31, wherein the distance is between about 20 and 40 cm.

33. The snowmobile of claim 32, wherein the distance is between about 22 and 32 cm.
34. The snowmobile of claim 33, wherein the distance is about 25 cm.
35. The snowmobile of claim 34, wherein the distance is about 30 cm.
36. A snowmobile, comprising:
 - a frame;
 - an engine disposed on the frame;
 - a drive track disposed below the frame and connected operatively to the engine for propulsion of the snowmobile;
 - at least one ski disposed on the frame;
 - a seat disposed on the frame, suitable for a rider having a center of gravity; and
 - a steering device disposed on the frame forward of the seat, the steering device being operatively connected to the at least one ski for steering the snowmobile,
 - wherein the snowmobile has a center of gravity with the rider,
 - wherein a line passing through the center of gravity of the snowmobile with the rider and the center of gravity of the rider forms an angle with horizontal that is between about 35 and 84°.
37. The snowmobile of claim 36, wherein the angle is between about 45 and 75°.
38. The snowmobile of claim 37, wherein the angle is between about 55 and 70°.
39. The snowmobile of claim 38, wherein the angle is about 57°.
40. A snowmobile, comprising:
 - a frame;
 - a seat disposed on the frame, suitable for a rider;
 - a steering device disposed on the frame forward of the seat; and
 - right and left footrests disposed below the seat on either side thereof, suitable for placement of the rider's feet thereon,
 - wherein the seat defines a seat position, the steering device defines a steering position, and the footrests define a footrest position,
 - wherein a line passing through the seat position and the steering position forms angle α with a line passing through the seat position and the footrest position;

wherein a line passing through the footrest position and the steering position forms angle β with the line passing through the footrest position and the seat position,

wherein the line passing through the footrest position and the steering position forms angle γ with the line passing through the steering position and the seat position, and

wherein angle α is between about 63 and 152°, angle β is between about 16 and 84°, and angle γ is between about 11 and 42°.

41. The snowmobile of claim 40, wherein angle α is between about 67 and 112°, angle β is between about 41 and 72°, and angle γ is between about 22 and 45°.

42. The snowmobile of claim 41, wherein angle α is between about 75 and 97°, angle β is between about 52 and 67°, and angle γ is between about 30 and 41°.

43. The snowmobile of claim 44, wherein angle α is about 83°, angle β is about 64°, and angle γ is about 33°.

44. A snowmobile, comprising:

a frame;

a seat disposed on the frame, suitable for a rider;

a steering device disposed on the frame forward of the seat; and

right and left footrests disposed below the seat on either side thereof, suitable for

placement of the rider's feet thereon;

wherein the seat defines a seat position, the steering device defines a steering position, and the footrests define a footrest position,

wherein a line passing through the seat position and the steering position forms angle α with a line passing through the seat position and the footrest position;

wherein a line passing through the footrest position and the steering position forms angle β with the line passing through the footrest position and the seat position,

wherein the line passing through the footrest position and the steering position forms angle γ with the line passing through the steering position and the seat position, and

wherein angle α , angle β , and angle γ satisfy the relationship $\alpha \geq \beta \geq \gamma$.

45. A snowmobile, comprising:

a frame;

a seat disposed on the frame, suitable for a rider;

a steering device disposed on the frame forward of the seat; and

right and left footrests disposed below the seat on either side thereof, suitable for placement of the rider's feet thereon;

wherein the seat defines a seat position, the steering device defines a steering position, and the footrests define a footrest position,

wherein a line passing through the seat position and the steering position forms angle α with a line passing through the seat position and the footrest position;

wherein a line passing through the footrest position and the steering position forms angle β with the line passing through the footrest position and the seat position,

wherein the line passing through the footrest position and the steering position forms angle γ with the line passing through the steering position and the seat position, and

wherein angle α , angle β , and satisfy the relationship $\alpha \approx 2.5\gamma$.

46. A snowmobile, comprising:

a frame;

a seat disposed on the frame; and

a steering device disposed on the frame forward of the seat;

wherein the seat defines a seat position and the steering device defines a steering position, and

wherein a line passing through the steering position and the seat position forms an angle ϕ with horizontal that is between about 15 and 51°.

47. The snowmobile of claim 46, wherein angle ϕ is between about 19 and 41°.

48. The snowmobile of claim 47, wherein angle ϕ is between about 23 and 31°.

49. The snowmobile of claim 48, wherein angle ϕ is about 26°.

50. A snowmobile, comprising:

a frame;

an engine disposed on the frame;

at least one ski disposed on the frame;

a steering shaft operatively connected to the at least one ski for steering the snowmobile, the steering shaft being disposed over the engine at an angle ϵ of less than about 45° from vertical.

51. The snowmobile of claim 50, wherein angle ϵ is between about 25 and 40° from vertical.

52. The snowmobile of claim 51, wherein angle ϵ is between about 30 and 35° from vertical.

53. The snowmobile of claim 52, wherein angle ϵ is about 33° from vertical.

54. A snowmobile, comprising:

- a frame;
 - a seat disposed on the frame, suitable for a rider, the seat defining a location of a rider space associated with the seat;
 - a steering shaft disposed on the frame forward of the seat; and
 - a handlebar mounted onto the steering shaft,
- wherein the handlebar and steering shaft are rotatable about a central axis between first and second positions to define a handlebar space, and
- wherein the handlebar space does not intersect with the rider space.

55. A snowmobile, comprising:

- a frame;
 - a seat disposed on the frame, suitable for a rider;
 - a steering device disposed forward of the seat; and
 - a windshield disposed forward of the steering device, the windshield having a top;
- wherein the seat defines a seat position and the steering device defines a steering position, and
- wherein a line between the steering position and the seat position forms an angle μ with a line between the seat position and the top of the windshield that lies between about 0 and 20°.

56. The snowmobile of claim 55, wherein angle μ is between about 10 and 20°.

57. The snowmobile of claim 56, wherein angle μ is about 18°.

58. A snowmobile, comprising:

- a frame;
- a seat disposed on the frame, suitable for a rider;
- a steering device disposed forward of the seat; and
- a windshield disposed forward of the seat, the windshield having a top;

wherein, when in motion, the windshield defines a laminar flow region of moving air that extends upwardly and rearwardly from the top thereof, and

wherein, when seated in the seat and when grasping the steering device, the rider's head is positioned within the laminar flow region.

59. A snowmobile, comprising:

- a frame;
- a forward-most drive track axle disposed on the frame; and
- a steering device disposed on the frame forward of the forward-most drive track axle.

60. A snowmobile, comprising:

- a frame;
- a steering device disposed on the frame;
- wherein the snowmobile has a center of gravity without a rider and the steering device is disposed on the frame forward of the center of gravity.

61. A snowmobile, comprising:

- a frame;
- a steering device disposed on the frame;
- wherein the snowmobile has a center of gravity with a rider and the steering device is disposed on the frame forward of the center of gravity.

62. A snowmobile, comprising:

- a frame;
- a seat disposed on the frame, suitable for a rider;
- right and left footrests disposed below the seat on either side thereof, suitable for placement of the rider's feet thereon; and
- a steering device disposed forward of the footrests.

63. A snowmobile, comprising:

- a frame;
- a seat disposed on the frame, suitable for a rider;
- right and left sideboards extending laterally from the frame below the seat on either side thereof, each of the sideboards having a forward portion suitable for placement of the rider's feet thereon;
- right and left toe-holds disposed respectively above the forward portion of each sideboard for allowing the rider to releasably secure himself to the snowmobile;
- a steering device disposed forward of the forward portions of the sideboards.

64. A snowmobile, comprising:
a frame;
a seat disposed on the frame, defining a seat position;
a steering device disposed on the frame and forward of the seat defining a steering position,
wherein a distance between vertical lines passing through the steering position and the seat position is between about 40 and 90 cm.
65. The snowmobile of claim 64, wherein the distance is between about 50 and 80 cm.
66. The snowmobile of claim 65, wherein the distance is between about 60 and 80 cm.
67. The snowmobile of claim 66, wherein the distance is about 65 cm.
68. The snowmobile of claim 67, wherein the distance is about 70 cm.
69. A snowmobile, comprising:
a frame;
a seat disposed on the frame, suitable for a rider; and
right and left footrests disposed below the seat on either side thereof, suitable for placement of the rider's feet thereon, the footrests disposed at an angle Δ with horizontal that is between about +10 and -20°.
70. The snowmobile of claim 69, wherein angle Δ is between about +10 and -10°.
71. The snowmobile of claim 70, wherein angle Δ is between about 0 and -5°.
72. The snowmobile of claim 71, wherein angle Δ is about -5°.
73. A snowmobile, comprising:
a frame;
a seat disposed on the frame, suitable for a rider;
right and left sideboards extending laterally from the frame below the seat on either side thereof, each of the sideboards having a forward portion suitable for placement of a rider's foot thereon, the forward portion of each sideboard disposed at an angle Δ with horizontal that is between about +10 and -20°;

right and left toe-holds disposed respectively above the forward portion of each sideboard for allowing the rider to releasably secure himself to the snowmobile.

74. The snowmobile of claim 73, wherein angle Δ is between about $+10^\circ$ and -10° .

75. The snowmobile of claim 74, wherein angle Δ is between about 0° and -5° .

76. The snowmobile of claim 75, wherein angle Δ is about -5° .

77. A snowmobile, comprising:

a frame;

a seat disposed on the frame, suitable for a rider;

a steering device disposed on the frame forward of the seat; and

right and left sideboards extending laterally from the frame below the seat on either side thereof, each of the sideboards having a forward portion suitable for placement of a rider's foot thereon,

wherein the seat defines a seat position, the steering device defines a steering position, and the forward portions of the sideboards define a footrest position,

wherein a line passing through the seat position and the steering position forms angle α with a line passing through the seat position and the footrest position;

wherein a line passing through the footrest position and the steering position forms angle β with the line passing through the footrest position and the seat position,

wherein the line passing through the footrest position and the steering position forms angle γ with the line passing through the steering position and the seat position, and

wherein angle α is between about 63° and 152° , angle β is between about 16° and 84° , and angle γ is between about 11° and 42° .

78. The snowmobile of claim 77, wherein angle α is between about 67° and 112° , angle β is between about 41° and 72° , and angle γ is between about 22° and 45° .

79. The snowmobile of claim 78, wherein angle α is between about 75° and 97° , angle β is between about 52° and 67° , and angle γ is between about 30° and 41° .

80. The snowmobile of claim 79, wherein angle α is about 83° , angle β is about 64° , and angle γ is about 33° .

81. A snowmobile, comprising:

a frame;
 a seat disposed on the frame, suitable for a rider;
 a steering device disposed on the frame forward of the seat; and
 right and left sideboards extending laterally from the frame below the seat on either side thereof, each of the sideboards having a forward portion suitable for placement of a rider's foot thereon,

wherein the seat defines a seat position, the steering device defines a steering position, and the forward portions of the sideboards define a footrest position,

wherein a line passing through the seat position and the steering position forms angle α with a line passing through the seat position and the footrest position;

wherein a line passing through the footrest position and the steering position forms angle β with the line passing through the footrest position and the seat position,

wherein the line passing through the footrest position and the steering position forms angle γ with the line passing through the steering position and the seat position, and

wherein angle α , angle β , and angle γ satisfy the relationship $\alpha \geq \beta \geq \gamma$.

82. A snowmobile, comprising:

a frame;

a seat disposed on the frame, suitable for a rider;

a steering device disposed on the frame forward of the seat; and

right and left sideboards extending laterally from the frame below the seat on either side thereof, each of the sideboards having a forward portion suitable for placement of a rider's foot thereon,

wherein the seat defines a seat position, the steering device defines a steering position, and the forward portions of the sideboards define a footrest position,

wherein a line passing through the seat position and the steering position forms angle α with a line passing through the seat position and the footrest position;

wherein a line passing through the footrest position and the steering position forms angle β with the line passing through the footrest position and the seat position,

wherein the line passing through the footrest position and the steering position forms angle γ with the line passing through the steering position and the seat position, and

wherein angle α , angle β , and satisfy the relationship $\alpha = 2.5\gamma$.

83. The snowmobile of any one of claims 77 to 82 further comprising:
 right and left toe-holds disposed respectively above the forward portion of each sideboard for allowing the rider to releasably secure himself to the snowmobile.